REMARKS

Claims 1-16 are now pending in the application. Claim 16 is new; support is found in the original specification as filed, including paragraphs [0009], [0036], [0040], [0042], and [0044]-[0050]. Independent claims 1 and 13 are amended to indicate the coating composition optionally includes a polymeric or oligomeric material. Support is found in the original specification as filed, including paragraph [0003] and Examples 3-6 in paragraphs [0051]-[0055]. Claims 1-13 and 15 are also amended to remove "non polymeric." Support is found in the original specification as filed, including Examples 3-6 in paragraphs [0051]-[0055]. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

SPECIFICATION

Amendments were made to the specification, paragraph [0027], to remove unnecessary wording.

REJECTION UNDER 35 U.S.C. § 102 – BOISSEAU

Claims 1-3 and 7-15 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Boisseau et al. (U.S. Pat. App. Pub. No. 2002/0155278). This rejection is respectfully traversed.

Independent claims 1, 13, and 16 include features not present in Boisseau and therefore are not anticipated by the reference. A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d

628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). In this case, Boisseau does not teach a thermosetting coating composition that includes a monomeric material having a plurality of active hydrogen groups. Instead, the film-forming component of Boisseau is either polymeric or oligomeric. Boisseau paragraph [0048].

The present claims and specification use the terms monomeric, oligomeric, and polymeric as they are generally understood in the art to describe three different materials. These terms are used independently and the specification differentiates between polymeric and oligomeric materials versus monomeric materials, and also provides many exemplary embodiments of the claimed monomeric material having a plurality of active hydrogen groups. Paragraphs [0004], [0007], and [0013]–[0027]. Interpretation of claims and claim features begins with the words of the claims themselves, the context in which the claimed features are used within the specification, and understanding of the features by one of ordinary skill in the art. *Phillips v. AWH Corp.*, 415 F.3d at 1314, 75 USPQ2d at 1327 (meaning of a claim term may be evidenced by the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art).

The present specification does not set out any formal definitions of monomeric, oligomeric, and polymeric materials, and instead uses these terms in their conventional sense as understood by a skilled artisan in the coating arts. These terms, however, are used distinctly to refer to different types of materials; *e.g.*, paragraphs [0003], [0004], [0012]-[0022], [0040]-[0041]; U.S. Pat. Nos. 5,693,724, 5,693,723, 5,639,828, 5,512,639, 5,508,379, 5,451,656, 5,356,669, 5,336,566, and 5,532,061, which are

incorporated by reference as per paragraph [0002]; and present Examples 4-6, which use a carbamate-functional monomer in conjunction with an acrylic polymer. Thus, the present claims and specification are referring to three different materials when reciting monomeric, oligomeric, and polymeric materials.

As provided by *Phillips v. AWH Corp.*, one may look to extrinsic sources regarding the meaning of technical terms in the art. The International Union of Pure and Applied Chemistry (IUPAC), to which the National Academy of Sciences in the United States is an adhering body, publishes a compendium of chemical terminology known as the Gold Book, which is available online at http://goldbook.iupac.org/. The Gold Book defines monomer, oligomer, and polymer (and adjectival uses thereof, such as monomeric material), as follows:

> **monomer molecule**: A molecule which can undergo polymerization thereby contributing constitutional units to the essential structure of a macromolecule.
> **monomeric unit** (monomer unit, mer): The largest constitutional unit contributed by a single monomer molecule to the structure of a macromolecule or oligomer molecule. Note: The largest constitutional unit contributed by a single monomer molecule to the structure of a macromolecule or oligomer molecule may be described as either monomeric, or by monomer used adjectivally.
> **oligomer molecule**: A molecule of intermediate relative molecular mass, the structure of which essentially comprises a small plurality of units derived, actually or conceptually, from molecules of lower relative molecular mass. Notes: A molecule is regarded as having an intermediate relative molecular mass if it has properties which do vary significantly with the removal of one or a few of the units. If a part or the whole of the molecule has an intermediate relative molecular mass and essentially comprises a small plurality of units derived, actually or conceptually, from molecules of lower relative molecular mass, it may be described as oligomeric, or by oligomer used adjectivally.
> **polymer molecule**: See: macromolecule
> **macromolecule (polymer molecule)**: A molecule of high relative molecular mass, the structure of which essentially comprises the multiple repetition of units derived, actually or conceptually, from molecules of low relative molecular mass. Notes: In many cases, especially for synthetic

polymers, a molecule can be regarded as having a high relative molecular mass if the addition or removal of one or a few of the units has a negligible effect on the molecular properties. This statement fails in the case of certain macromolecules for which the properties may be critically dependent on fine details of the molecular structure. If a part or the whole of the molecule has a high relative molecular mass and essentially comprises the multiple repetition of units derived, actually or conceptually, from molecules of low relative molecular mass, it may be described as either macromolecular or polymeric, or by polymer used adjectivally.

As such, a small plurality of monomer units may be used to form an oligomer, and a monomer and an oligomer are recognized as two different types of materials and are not one in the same.

In further support, Applicants submit that "[p]olymers are large molecules made up of simple repeating units. . . . *Macromolecule* is a term synonymous with polymer. Polymers are synthesized from simple molecules called *monomers* ('single part') by a process called *polymerization*." Malcolm P. Stevens, Polymer Chemistry, An Introduction, 3rd Ed., p. 3, Copyright © 1999 by Oxford University Press. "As already mentioned, the term *polymer* refers to large molecules – macromolecules – whose structure depends on the monomer or monomers used in their preparation. If only a few monomer units are joined together, the resulting low-molecular weight polymer is called an *oligomer* (Greek *oligos*, 'few')." Id at 6. Therefore, as recognized in the art, the term oligomer refers to short polymers, typically formed of a few monomer units. "The conversion of a monomer or a mixture of monomers into an oligomer is defined as oligomerization. Encyclopedia of Polymer Science and Engineering, 2nd Ed., Vol. 10, p. 432, Herman F. Mark, ed., (1987 by John Wiley & Sons). The illustrative examples of monomeric materials provided in the present disclosure in paragraphs [0013]-[0027] comport with these definitions and a skilled artisan would invariably conclude that a

monomeric material (as used in independent claims 1 and 13) is not and does not include an oligomeric material.

Applicants emphasize that independent claim 1 is expressly drawn to at least one monomeric material and optionally includes a polymeric or oligomeric material. It is clear and unambiguous from the claim language, including the specification and examples provided therein, that the claims must include a monomeric material having a plurality of active hydrogen groups. An oligomer or a polymer cannot substitute for the monomeric material. What is more, Applicants have amended independent claims 1 and 13 to recite that the thermosetting coating composition optionally includes a polymeric or oligomeric material, for example as illustrated in Examples 4-6, but the composition still must include the monomeric material having a plurality of active hydrogen groups. See *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art.").

Indeed, claims 1 and 13 include the open-ended transitional phrase "comprising" such that additional materials may be present in the thermosetting coating composition. However, regardless of the presence of these other materials, the composition must include at least one monomeric material having a plurality of active hydrogen groups, as expressly recited. See *In re Wilder*, 429 F.2d 447, 166 USPQ 545, 548 (C.C.P.A. 1970) (every limitation positively recited in a claim must be given effect in order to determine what subject matter that claim defines). The separate recitation of these features within independent claims 1 and 13 further serves to identify to a person of ordinary skill in the

art that the monomeric material is different than the optional oligomeric material or polymeric material.

During patent examination, claims may only be interpreted as broadly as their terms reasonably allow. *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) (pending claims interpreted as broadly as their terms reasonably allow). The operative word is "reasonably," and it is unreasonable to interpret the claim terms in contravention to their accepted meanings in the art and their use in the present specification. The Examiner's inference that the oligomers of Boisseau are "macromonomers" and somehow qualify as "monomers" is without merit. Paragraph bridging pages 2-3 of the Final Office Action dated August 28, 2006. Notably, the term "macromonomer" is absent in Boisseau, but the reference does illustrate how oligomers are formed from monomers, as discussed further below.

There is no basis for interchangeability or equivalence of the claimed monomeric material and an oligomeric material, as disclosed by Boisseau. The Boisseau reference provides coating compositions and coating methods having a film-forming component (a). The film-forming component (a) may be polymeric or oligomeric and will generally comprise one or more compounds or components having a number average molecular weight of from 900 to 1,000,000, for example. Boisseau paragraph [0048]. Examples of polymer resins are listed in Boisseau paragraph [0051]. The molecular weight of polymers refers to the number average molecular weight (Boisseau paragraph [0052]); *i.e.*, the number average molecular weight is the total weight of the sample divided by the number of molecules in the sample, thereby averaging a mixed population of polymers formed of different numbers of repeating subunits.

Perhaps most notably, Boisseau also discloses how to prepare polymers (for use as the film-forming component) from monomers. See Boisseau paragraph [0054]; see also paragraphs [0063] to [0098] for preferred carbamate functional polymers, polyester polymers, and polyurethane polymers. Furthermore, the only reference to monomers in Boisseau is in terms of using them to prepare polymers for use as the film-forming component. See Boisseau paragraphs [0052], [0054], and [0055]. The use and context of the terms polymer, oligomer, and monomer in Boisseau are in-line with the general understanding of these terms in the art and a person of ordinary skill in the coating arts recognizes that Boisseau is referring to different materials. Finally, description of these materials in Boisseau and use of the associated terminology in the Boisseau reference also comport with the extrinsic sources cited above.

In sum, the terms polymeric, oligomeric, and monomeric are used separately and distinctly and refer to different materials. Never is an oligomer described as a monomer or "macromonomer;" such an inference is without support. Consequently, the Boisseau composition does not anticipate the present invention as it fails to include at least one monomeric material. Since independent claims 1, 13, and 16 are not anticipated, all dependent claims stemming therefrom are not anticipated. Withdrawal of the rejection and reconsideration of the claims are respectfully requested.

REJECTION UNDER 35 U.S.C. § 103 – BOISSEAU IN VIEW OF GREEN AND OHRBOM

Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Boisseau et al. (U.S. Pat. App. Pub. No. 2002/0155278) in view of Green et al.

(U.S. Pat. No. 5,872,195) and Ohrbom et al. (U.S. Pat. No. 5,756,213). This rejection is respectfully traversed.

As detailed in traverse of the 102 rejection above, the Boisseau reference fails to teach a coating composition having at least one monomeric material that has a plurality of active hydrogen groups. Addition of the Green and Ohrbom references fails to cure this deficiency; the combination does not include the monomeric material of independent claims 1, 13, and 16. Since the prior art reference (or references when combined) must teach or suggest all the claim limitations, claims 1 and 13, and their dependents, are not obvious. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974) (all claim limitations must be taught or suggested by the prior art).

Furthermore, there is no apparent reason or basis in the combination of references to replace the film-forming component (i.e., the polymeric or oligomeric resin of Boisseau) with a monomeric material to make a coating composition with at least one monomeric material having a plurality of active hydrogen groups. These references do not appreciate use of the monomeric material in the present disclosure.

The Ohrbom reference describes a compound (A) that has a carbamate or urea functionality where a compound (A)(1) having a carbamate or urea group and a hydroxyl group is reacted with a compound (A)(2) which may be a dialkyl carbonate, cyclic carbonate, or CO_2. Reaction of (A)(1) with (A)(2) will result in a compound having the residues of two (or more) (A)(1) compounds linked together by a carbonate group formed from the residue of compound (A)(2). With inclusion of a polyol, a polycarbonate compound can be formed. Ohrbom col. 2, lines 19-34; see also col. 7, lines 52-67. Thus, at least two (A)(1) compounds are joined by an (A)(2) compound

(i.e., at least two (A)(1) subunits/monomers are joined) and/or a polycarbonate polymer is formed. As a result, Ohrbom does not disclose a non-polymeric coating composition having a monomeric material as described in the present invention.

Green et al. discloses a curable coating composition having a polymer resin, curing agent, and a compound (c) having at least one carbamate group that is the reaction product of a hydroxyl group from a ring-opening reaction between an epoxy group and an organic acid group, and cyanic acid or a carbamate group. Green claim 1; abstract; col. 2, lines 1-11; and col. 5, lines 28-36. Thus, Green describes a polymeric coating composition where a polymer resin with active hydrogen-containing functional groups reacts with a curing agent. The Green polymeric coating composition further contains a carbamate compound (c) that contains at least one carbamate group, but the primary film-forming component of Green is the polymer resin, examples of which are listed in col. 2, lines 14-27.

The background of Green indicates that curable coating compositions utilizing carbamate-functional resins provide significant etch advantages. However, there is no suggestion or motivation that a skilled artisan would gather from the combination of Green, Boisseau, and Ohrbom that would lead to a coating composition having a monomeric material having a plurality of active hydrogen groups. In each reference (Green, Boisseau, and Ohrbom), the respective coating compositions contain a polymeric resin (Green), a film-forming component (Boisseau), or at least two of the same compound linked that can further include polycarbonates (Ohrbom), where each in turn reacts with a crosslinker.

In addition, compound (c) of the Green reference contains "at least one carbamate" group while the present invention describes a monomeric material having a "plurality of active hydrogen groups," which can be carbamate groups. A "plurality of active hydrogen groups" in the present invention requires at least two such groups. See, for example, paragraph [0024] illustrating various embodiments of the monomeric material having two carbamate groups; and see paragraph [0017] describing embodiments of the monomeric material comprising "at least two functional groups." The difference between having one carbamate group and two carbamate groups is important in the curing of a coating composition. For example, all three of the cited references contain other polymeric resins that react with a crosslinker to form a polymerized cured coating; these polymeric resins are missing from the present invention (i.e., the present invention is to a non-polymeric coating composition). In contrast, the present invention does not require a polymeric resin that reacts with a crosslinker.

The carbamate compound (c) from Green is further differentiated from the monomeric material of the present invention in that since compound (c) can have just one carbamate group, it would then react with a crosslinker at only the single carbamate moiety. As such, the cured coating composition in Green would be very different from the cured coating composition of the present invention where a non-polymeric coating composition having a monomeric material with a plurality (i.e., at least 2) of active hydrogen groups reacts with a crosslinker.

Thus, the present invention identifies and utilizes a specific species of carbamate containing compounds (i.e., monomeric materials having at least two carbamates) that

are necessary for the present invention. A monomeric material having a single carbamate group would not function in a similar fashion and is not included in the presently claimed invention. Therefore, the monomeric material having a plurality of active hydrogen groups would not have been obvious in the combination of the aforementioned references, since each of the references contains a separate polymeric resin which can react with a crosslinker to provide a polymerized and cured coating. Addition of a single carbamate containing compound (c) from the Green reference can react with a crosslinker, but cannot participate in the same type of curing reaction as can the monomeric material having a plurality of active hydrogen groups of the present invention.

Since there is no reason or basis identified as to why a skilled artisan would use a monomeric material with a plurality (at least two) of reactive hydrogen groups in a coating composition based on the cited references, the present invention is not obvious. See *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1740-41, 82 USPQ2d 1385, 1396 (2007) (obviousness includes determining whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue).

Withdrawal of the rejection and reconsideration of the claims are respectfully requested.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

Dated: September 18, 2008

By: William A. Ziehler

Anna M. Budde, Reg. No. 35,085.
William A. Ziehler, Reg. No. 61,415

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WAZ/akb

enclosures:

Five (5) pages of IUPAC Goldbook definitions for: monomer molecule, monomeric unit, oligomer molecule, polymer molecule, and macromolecule (polymer molecule).

Pages 3 and 6 from Malcolm P. Stevens, Polymer Chemistry, An Introduction, 3rd Ed., p. 3, Copyright © 1999 by Oxford University Press.

Page 432 from Encyclopedia of Polymer Science and Engineering, 2nd Ed., Vol. 10, Herman F. Mark, ed., (1987 by John Wiley & Sons)

search

PREVIOUS
monomer

Indexes
- alphabetical
- chemistry
- math/physics
- general
- source documents

monomer molecule

A molecule which can undergo polymerization thereby contributing constitutional units to the essential structure of a macromolecule.

Source:
PAC, 1996, *68*, 2287 *(Glossary of basic terms in polymer science (IUPAC Recommendations 1996))* on page 2289

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		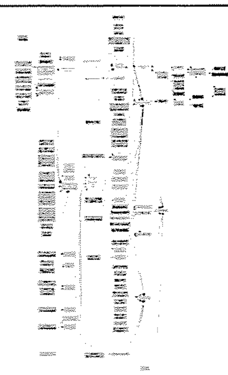

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IUPAC GOLD BOOK

search

PREVIOUS
monomer unit

Indexes

- alphabetical
- chemistry
- math/physics
- general
- source documents

monomeric unit (monomer unit, mer)

The largest constitutional unit contributed by a single monomer molecule to the structure of a macromolecule or oligomer molecule.

Note:
The largest constitutional unit contributed by a single monomer molecule to the structure of a macromolecule or oligomer molecule may be described as eitl adjectivally.

Source:
PAC, 1996, *68*, 2287 *(Glossary of basic terms in polymer science (IUPAC Recommendations 1996))* on page 2290

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	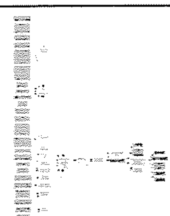	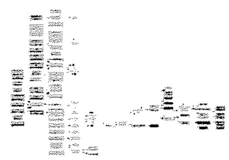

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Last update: 2008-09-12; version: 2.0.1.

DOI of this term: doi:10.1351/goldbook.M04018.

Original PDF version (may be out of date): http://www.iupac.org/goldbook/M04018.pdf.

Indexes

- alphabetical
- chemistry
- math/physics
- general
- source documents

oligomer molecule

A molecule of intermediate relative molecular mass, the structure of which essentially comprises a small plurality of units derived, actually or conceptually, fr molecular mass.

Notes:

1. A molecule is regarded as having an intermediate relative molecular mass if it has properties which do vary significantly with the removal of one or a fe
2. If a part or the whole of the molecule has an intermediate relative molecular mass and essentially comprises a small plurality of units derived, actually lower relative molecular mass, it may be described as oligomeric, or by oligomer used adjectivally.

Source:
PAC, 1996, *68*, 2287 *(Glossary of basic terms in polymer science (IUPAC Recommendations 1996))* on page 2289

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	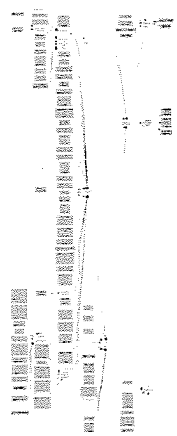	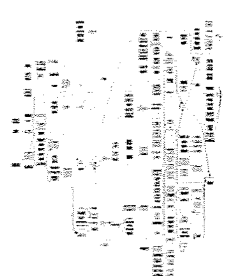

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polymer molecule

See: macromolecule

Source:
PAC, 1996, *68*, 2287 *(Glossary of basic terms in polymer science (IUPAC Recommendations 1996))* on page 2289

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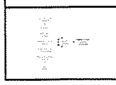	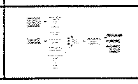	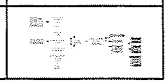

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search

PREVIOUS
macromolecular isomorphism

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macromolecule (polymer molecule)

A molecule of high relative molecular mass, the structure of which essentially comprises the multiple repetition of units derived, actually or conceptually, fror mass.

Notes:

1. In many cases, especially for synthetic polymers, a molecule can be regarded as having a high relative molecular mass if the addition or removal of or effect on the molecular properties. This statement fails in the case of certain macromolecules for which the properties may be critically dependent on f
2. If a part or the whole of the molecule has a high relative molecular mass and essentially comprises the multiple repetition of units derived, actually or c relative molecular mass, it may be described as either macromolecular or polymeric, or by polymer used adjectivally.

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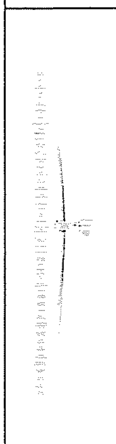	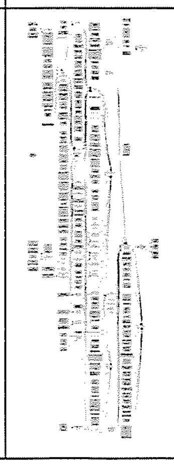	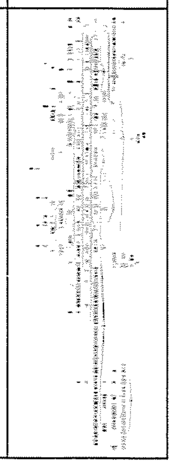

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Original PDF version (may be out of date): http://www.iupac.org/goldbook/M03667.pdf.

C H A P T E R 1

BASIC PRINCIPLES

1.1 Introduction and Historical Development

We live in a polymer age. Plastics, fibers, elastomers, coatings, adhesives, rubber, protein, cellulose—these are all common terms in our modern vocabulary, and all a part of the fascinating world of polymer chemistry. Innumerable examples of synthetic polymers may be cited, some everyday ones, others esoteric: polyester and nylon textile fibers; high-strength polyamide fibers for lightweight bulletproof vests; polyethylene plastic for milk bottles; polyurethane plastic for an artificial heart; rubber for automobile tires; fluorinated phosphazene elastomers that remain flexible in arctic environments. Whatever example or application one might select for purposes of illustration, an underlying consideration is that the particular polymer, for reasons of its unique properties or its economy, or both, is used because it does the job better than other available materials.

The purpose of this book is to provide an understanding of the chemistry of polymeric materials—how these materials differ from nonpolymers, how they are synthesized, and how they may be modified to assume a range of chemical and physical properties. While the experimental techniques for handling polymers may be somewhat different from those used with low-molecular-weight compounds, the chemistry of polymers will, in most cases, be familiar to the student who has completed introductory courses in organic and physical chemistry. The major adjustment the student has to make in beginning a study of polymers is to recognize that polymers exhibit certain properties, especially macroscopic ones, that differ markedly from those of the low-molecular-weight compounds usually encountered in undergraduate courses.

Polymers are large molecules made up of simple repeating units. The name is derived from the Greek *poly*, meaning "many," and *mer*, meaning "part." *Macromolecule* is a term synonymous with polymer. Polymers are synthesized from simple molecules called *monomers* ("single part") by a process called *polymerization*. Given the fact that most synthetic polymers have molecular weights in the range of several thousand up to several million atomic mass units, it is obviously impractical to attempt to write a definitive polymer structure. Instead a structural unit of the polymer is enclosed by brackets

the theories of Staudinger on a firm experimental basis and led to the commercial development of neoprene rubber and polyamide (nylon) fibers.[11]

World War II led to significant advances in polymer chemistry, particularly with the development of synthetic rubber when the natural rubber-growing regions of the Far East became inaccessible to the Allies. Among the more significant developments of the postwar years was the discovery by Karl Ziegler[12] in Germany of new coordination catalysts for initiating polymerization reactions and the application by Giulio Natta in Italy of these new systems to development of polymers having controlled stereochemistry.[13] Their work has revolutionized the polymer industry, for these so-called stereoregular polymers have mechanical properties superior in most instances to those of nonstereoregular polymers. The importance of their discoveries was recognized by the award of the Nobel Prize in Chemistry jointly to Ziegler and Natta in 1963. Equally significant was the work of Paul Flory[14] (Nobel Prize 1974), who established a quantitative basis for polymer behavior, whether it be the physical properties of macromolecules in solution or in bulk or such chemical phenomena as crosslinking and chain transfer (concepts to be encountered later in this text).

More recent years have seen a number of important advances in polymer science, which will be elaborated on in this and later chapters. Examples include:

- Polymers having excellent thermal and oxidative stability, for use in high-performance aerospace applications
- Engineering plastics—polymers designed to replace metals
- High-strength aromatic fibers, some based on liquid crystal technology, for use in a variety of applications from tire cord to cables for anchoring oceanic oil-drilling platforms
- Nonflammable polymers, including some that emit a minimum of smoke or toxic fumes
- Degradable polymers, which not only help reduce the volume of unsightly plastics waste but also allow controlled release of drugs or agricultural chemicals
- Polymers for a broad spectrum of medical applications, from degradable sutures to artificial organs
- Conducting polymers—polymers that exhibit electrical conductivities comparable to those of metals
- Polymers that serve as insoluble supports for catalysts or for automated protein or nucleic acid synthesis (Bruce Merrifield, who originated solid-phase protein synthesis, was awarded the Nobel Prize in Chemistry in 1984)

This list, by no means exhaustive, clearly illustrates that polymer chemistry is an exciting field with almost limitless possibilities.

1.2 Definitions

As already mentioned, the term *polymer* refers to large molecules—macromolecules—whose structure depends on the monomer or monomers used in their preparation. If only a few monomer units are joined together, the resulting low-molecular-weight polymer is called an *oligomer* (Greek *oligos*, "few"). The structural unit enclosed by brackets or parentheses is

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OLIGOMERS

The International Union of Pure and Applied Chemistry (IUPAC) defines oligomer as a substance composed of molecules containing a few of one or more species of atoms or groups of atoms (constitutional units) repetitively linked to each other (1). This does not specify an absolute degree of polymerization or molecular weight that distinguishes an oligomer from a polymer, but the IUPAC definition further states that the physical properties of an oligomer vary with the addition or removal of one or a few of the constitutional units from its molecules. This structure–property definition is perhaps the most meaningful definition of an oligomer. The conversion of a monomer or a mixture of monomers into an oligomer is defined as oligomerization. This definition does not imply any constraints on the oligomer polydispersity. Therefore, although monodisperse oligomers provide more valuable information than polydisperse oligomers, the latter are still important.

The term oligomer originates from the Greek words $o\lambda\iota\gamma o\zeta$ = few and $\mu\epsilon\rho o\zeta$ = part, and was first used in the field of synthetic polymer chemistry in the early 1950s (2), having been taken from the nomenclature of natural products, ie, oligosaccharides (3), oligopeptides (4), etc. A recent book on the history of polymer science (qv) (5) asserts that the name was first suggested by L. V. Larsen for a laboratory manual published by G. F. D'Alelio in 1943 (6). The name oligomer has been adopted by Kern (7) and Zahn (8), and their extensive work in this field led to its present widely accepted meaning.

The first attempts made by Staudinger to convince the organic chemistry community of the macromolecular nature of polymers were partially based on research performed on oligomers (9). Staudinger and Luthy (10) separated the α,ω-dimethyl ethers of polyoxymethylene (POM) with degrees of polymerization (DP) up to 14 and the α,ω-dimethyl esters of POM with DP up to 20. Although